

REMARKS

Applicant notes that the office action summary (item 10) is ambiguous as to whether or not the drawings have been accepted by the Examiner. Clarification is respectfully requested.

Claim 8 has been canceled. Claims 1-7 and 9-87 are now pending in the application. Of these, claims 9, 10 and 14 have been amended to avoid depending from a canceled claim. Claims 45, 70, 71 and 73 have been amended to correct typographical errors. No change is made in the scope of these claims, and no file history estoppel should result.

Claims 8-10, 14 and 20-23 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Claim 8 has been canceled and the rejection thereof is thus rendered moot. Claims 9, 10, 14 have been amended to depend from claim 1. Claims 20-23 depend, directly or indirectly, from amended claim 9. Claims 20 and 21 have been amended for consistency in view of the amendments to claim 9. As discussed below, claim 1 is believed to be in immediate condition for allowance and claims 9, 10, 14 and 20-23 are likewise believe to be in condition for allowance.

Claims 1-3, 5-15 and 24-27 stand rejected under 35 U.S.C. § 103 (a) as being unpatentable over United States patent No. 6,140,670 to Chang (Chang) in view of United States patent No. 5,942,775 to Yiannoulos (Yiannoulos).

It is acknowledged in the Office Action that "Chang lacks a... first doped region of the second conductivity type under the isolation region 204." The Office Action proposes to combine Chang with Yiannoulos in order to overcome this deficiency.

Such a combination, however, is not properly made. In order to combine references to establish obviousness under 35 U.S.C. § 103 (a), there must be some suggestion or motivation found in the prior art to combine the references. No such motivation is found here.

Yiannoulos says of the tubs 106 only that "the p-tub substrate region 133 adjoins other n-tub or p-tub regions 106 of the substrate 102... It should be noted that the other n-tub or p-tub regions 106 are not necessarily required for the present invention, but rather are material only with respect to overall CMOS technology in the context of a specific example of a layout." There is nothing in Chang or Yiannoulos to suggest that such additional tubs are desirable in the context of Chang or to motivate their inclusion therewith. Accordingly, the combination is not properly made and the subject rejections should be withdrawn.

Even accepting, *arguendo*, that such a combination is properly made, however, the Chang and Yiannoulos references do not teach or suggest the invention as claimed and the rejection should be withdrawn.

The present invention relates to optimized low leakage diodes including photodiodes. Claim 1 recites:

A diode, said diode comprising: to an isolation region formed in a substrate; a first doped active layer of a first conductivity type formed in said substrate, wherein said doped active layer is spaced apart from said isolation region; a second doped active layer of a second conductivity type in contact with said first doped active layer, the contact of said first and second active layers forming a p-n junction; and a third doped region formed in said second doped active layer beneath said isolation region. (Emphasis added).

The Chang reference relates to "a photodiode structure having a first conductive type substrate and at least an isolation region, the photodiode structure comprising a doped second conductive type region, wherein the doped second conductive type region is formed in the substrate at a distance from the neighboring isolation region." Abstract. Yiannoulos shows in figure 1 a "p-tub substrate region 133 [that] adjoins other n-tub or p-tub regions 106 of the substrate 102, and is also surrounded by a field (thick) oxide (SiO₂) layer 104," (emphasis added). Column 4, lines 37-40. It is clear that the regions 106 of Yiannoulos are in the substrate of the device (column 4, lines 38-39) and not in the p-tub region 133 (second doped active layer). Therefore, Yiannoulos teaches directly away from a combination with Chang that would lead one to the claimed invention.

Chang and Yiannoulos, whether taken alone or in combination, do not teach or suggest a "third doped region formed in said second doped active layer beneath said isolation region," (emphasis added). Therefore, Chang and Yiannoulos do not anticipate claim 1 or render it obvious, and the rejection of claim 1 under 35 U.S.C. § 103 (a) should be withdrawn.

Claims 2, 3, 5-15 and 24-27 each depend, directly or indirectly, from claim 1 and incorporate every limitation thereof. Accordingly, the rejection of s of claims 2, 3, 5-15 and 24-27 under 35 U.S.C. § 103 (a) over Chang in view of Yiannoulos should be withdrawn for at least the reasons given above in relation to claim 1.

Claims 4, 16-23 and 28-87 stand rejected under 35 U.S.C. § 103 (a) as being unpatentable over Chang and Yiannoulos in further view of United States patent No. 6,150,676 to Sasaki (Sasaki). In the Office Action it is acknowledged that Chang and Yiannoulos do not teach or suggest the claim 4 limitations that "said isolation region is a field oxide region formed by the Shallow Trench Isolation process," among others. The

Office Action proposes to combine Chang and Yiannoulos with Sasaki in order to overcome these deficiencies.

Claims 4 and 16-23 each depend, directly or indirectly, from claim 1 and incorporate every limitation thereof. As discussed above, in relation to claim 1, the combination of Chang and Yiannoulos fails to teach or suggest every limitation of claim 1. The further combination of Chang and Yiannoulos with Sasaki does not remedy this deficiency. Accordingly, Chang, Yiannoulos, and Sasaki, whether taken alone or in combination, do not anticipate claims 4 and 16-23 or render them obvious.

In relation to claim 28, and to claims 29-49 which depend directly or indirectly therefrom: Chang, Yiannoulos, and Sasaki, whether taken alone or in combination, do not teach or suggest the unique combination of limitations of claim 28 including, "a first doped active layer... spaced apart from said isolation region; a second doped active layer... formed within said first doped active layer...; and a third doped region proximate to a lower boundary of said isolation region," (emphasis added). For at least this reason, Chang, Yiannoulos and Sasaki do not anticipate claim 28 or render it obvious, and the rejection of claims 28-49 under 35 U.S.C. § 103 (a) should be withdrawn.

In relation to claim 50, and to claims 51-66 which depend directly or indirectly therefrom: Chang, Yiannoulos and Sasaki, whether taken alone or in combination, do not teach or suggest the unique combination of limitations of claim 50 including, "a first doped photoactive layer... wherein said first doped layer is spaced apart from said isolation region; a second doped photoactive layer of a second conductivity type disposed in contact with said first doped photoactive layer...; and a third doped region formed in said second doped photoactive layer beneath said isolation region," (emphasis added). For at least this reason the rejection of claims 50-66 under 35 U.S.C. § 103 (a) over Chang, Yiannoulos and Sasaki should be withdrawn.

In relation to claim 67 and to claims 68-87 which depend directly or indirectly therefrom: Chang, Yiannoulos and Sasaki, whether taken alone or in combination, do not teach or suggest the unique combination of limitations of claim 67 including, "a first doped photoactive layer... wherein said first doped photoactive layer is spaced apart from said isolation region; [and] a second doped photoactive layer... formed within said first doped photoactive layer." Accordingly, the rejection of claims 67-87 under 35 U.S.C. § 103 (a) over Chang, Yiannoulos and Sasaki should be withdrawn.

The Office Action suggests that "Chang does not disclose, or is not concerned with disclosing, details of elements/features that must be included in order to acquire a functional device, e.g., details regarding electrode/contacts to the diode structure, transistors integrated with the diode structure, etc." The Office Action goes on to suggest that "[g]iven Chang, alone or at least in combination with Yiannoulos and Sasaki, one of ordinary skill in the art would have clearly realized that Chang's structure must be integrated with other devices." As demonstrated above, however, there is nothing in the cited references, taken alone or in combination, to teach or suggest the particular combination of limitations as claimed. In particular, there is nothing to teach or suggest a "third doped region formed in said second doped active layer." Accordingly, Applicant respectfully submits that the application claims novel features not found in the prior art, and allowance of the pending claims is in order.

Application No.: 09/780,390

Docket No.: M4065.0111/P111-A

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. According, the Examiner is respectfully requested to pass this application to issue.

Dated: 16 OCT 2003

Respectfully submitted,

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